Strategy Research Project

THREE-DIMENSIONAL (3D) DISTRIBUTION

BY

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USAWC CLASS OF 2009

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Joint sustainment operations in Afghanistan were the method of success because they executed the sustainment trinity by using contractors, host-nation capabilities, and conventional logistics forces on the ground and in the air. This experience suggests that Army logisticians need to adapt a more holistic view of transportation modes, and away from the ground-centric default of Army trucks.

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USAWC STRATEGY RESEARCH PROJECT

THREE-DIMENSIONAL (3D) DISTRIBUTION

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ABSTRACT

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THREE-DIMENSIONAL (3D) DISTRIBUTION

> [It is necessary] to trace a biscuit from Lisbon into a man's mouth on the frontier, and provide for its removal from place to place, by land and by water, or no military operations can be carried on.
>
> —Duke of Wellington
> During the Peninsular War

In the twenty-first century, joint sustainment formations will require an expeditionary distribution capability to maintain the momentum of full-spectrum operations. Future sustainment operations, as witnessed by ongoing efforts in both Afghanistan and Iraq, must turn distribution challenges into opportunities by mastering Three-Dimensional (3D) Logistics, operational distribution, and effective battle command to underpin the foundation of successful sustainment operations in the contemporary operating environment (COE). This strategic research project (SRP) examines a case study of operational-level logistics in support of Operation Enduring Freedom (OEF) in Afghanistan to illustrate the effectiveness of the successful application of these critical requirements.

This SRP will focus on four specific areas. First, it will briefly describe the nature of the twenty-first century environment that will complicate sustainment operations, e.g. terrain, immature and non-existent infrastructure, unsecure lines of communications (ALOCs, SLOCs, GLOCs), and asymmetrical threats. Next, the SRP will define and describe 3D logistics, operational distribution, and battle command in order to present a common understanding of these critical aspects. The SRP will then present a case study of sustainment operations in support of OEF in order to demonstrate an example of the successful application of "expeditionary distribution." Finally, the SRP will provide

logistics planners and doctrinal writers a framework from which to plan and execute sustainment operations in support of full-spectrum operations.

The Current and Emerging Strategic Environment

The future, strategic security environment will continue to be extremely fluid, with continually-changing alliances, partnerships, and new, national and transnational threats.[1] To maintain this global presence joint sustainment must support U.S. endeavors with logistics services to sustain prolonged operations.[2] The Army's sustainment effort will be in the context of four missions in combination: offense, defense, and stability or civil support.[3] The lessons of the past seven years demonstrated the joint interdependence of logistics and the "heavy lifting" the Army sustainment community has contributed to the Global War on Terror (GWOT). In the words of one strategic analyst, "we must relearn what modern war is, we must look beyond our own borders and avoid ethnocentric and triumphalism solutions based on technological prowess alone." [4]

This future security environment will stretch the ability operationally to sustain formations and requires the proper operational application and synchronization of all capabilities within joint and coalition logistics teams.[5] As Sir Michael Howard once stated, "In today's confrontations, war fighting and peacekeeping cannot be separated. They melt into one another, and the conduct of each determines the success of the other."[6] The challenges of this sustainment environment are even more complicated as U.S. military logistics units continue to provide assistance to other nations as well.

The current and future joint logistics environment will require all operational commanders to execute with joint, interagency, and multi-national partners. However,

most GWOT partners provide combat forces without adequate logistics capabilities, thus increasing the number, scope, and complexity of operational-sustainment tasks required of US commanders. Strategic and operational challenges to support coalition operations include other countries' fielded forces with little or no expeditionary-logistics capabilities. U.S. and NATO doctrine states that sustainment of forces is a national responsibility.[7] Nonetheless, some allies will participate with the expectation the U.S. will provide some measure of logistics support.

Moreover, future adversaries will exploit the tactics of the smart and agile, presenting greater reach and lethality upon US logistics formations.[8] They will seek to disrupt freedom of action, drive up the costs of any American intervention, and finally, deny U.S. forces objectives.[9] The former U.S. Marine Corps commander Charles C. Krulak describes this battlefield as the Three-Block War.[10] Sustainment capabilities must ensure operational agility with proper joint logistics capabilities maintaining the momentum of operations throughout each block of this type of fight.

The Sustainment Trinity

Joint sustainment in the twenty-first century must support full-spectrum operations by executing operational distribution capabilities with the "Sustainment Trinity." The Sustainment Trinity is the framework that provides operational logistics commanders an ability to visualize the environment and affect the system of systems.[11] The Sustainment Trinity must provide operational distribution with a three-dimensional expeditionary approach (capacity); see the strategic/operational/tactical distribution capabilities moving, and link that capability to the tactical customer's needs (visibility); and execute operational battle command (control). Joint sustainment operations in

Afghanistan were the method of success because they executed the sustainment trinity by using contractors, host-nation capabilities, and conventional logistics forces on the ground and in the air.

Three-Dimensional Logistics (3D Logistics) Approach

Three-dimensional logistics (3D Logistics) is the operational art of an expeditionary approach to distribution in the "three dimensions" within the operational and tactical battlespace and is the capacity leg of the "Sustainment Trinity." In short, sustainment commanders look at operational distribution capabilities with a 3D view in order to ensure correctly application of distribution capacity by time/space/mission, asset availability, and merit equally. This 3D approach is not a ground-transportation-centric approach but weighs all other modes of distribution equally: USAF CDS/combat offload, contract aircraft and helicopters, commercial truck, as well as Combat Logistics Patrol. 3D log visualization linked to the correct distribution mode has the potential to maintain the momentum of combat operations nearly indefinitely.

Three-dimensional logistics uses all air, ground, and water assets weighted equally to execute the last tactical mile of distribution, integrated with operational logistics and the strategic pipeline. These expeditionary, distribution techniques from OEF provide a glimpse into the future of joint sustainment.

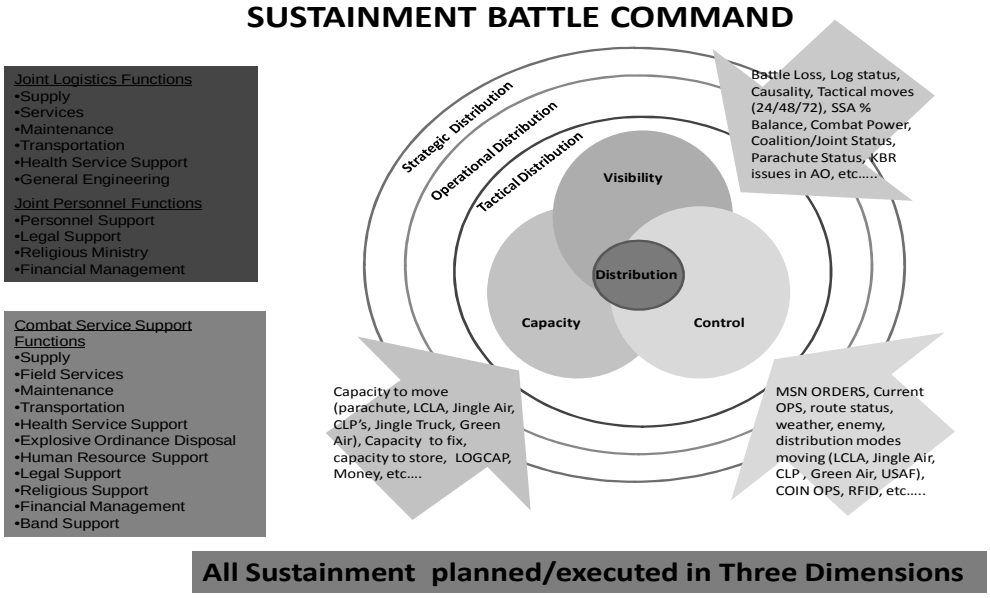

Figure 1. Sustainment Battle Command using visibility, capacity, and control.

Logistics Battle Command of 3D Logistics requires innovation and timely decisions to maintain momentum of operations, even with lack of ground lines of communication (GLOCs). The control aspect of the logistics trinity must be technologically agile, multidisciplinary, contingency focused, distribution integrated, and help commanders at all levels make timely decisions. The 3D logistics control nodes must Observe, Orient, Decide, and Act (O-O-D-A) upon every log issue faster than the maneuver elements understand their own logistics needs.[12] Control provides sustainment commanders the ability to redistribute logistical capabilities and resources dynamically, maintaining full-spectrum operations indefinitely.

The third leg of the sustainment trinity is visibility. This 3D visibility is a metrics-driven approach to "anticipatory logistics" in the sense that whichever unit has the ability to visualize the situation can act in time to achieve the correct logistics effects. Visibility requires knowing the current dispositions and activities of adversary and friendly forces,

and the strategic and operational distribution assets in motion throughout the battlespace. The integration of battle command and logistics management systems is imperative to visibility and directly link back to control and capacity in this trinity.

Battlefield Intelligence is critical to visualization within 3D Logistics. Intelligence analysis links to the active prioritization of distribution modes as appropriate, based on weather, route trafficability, enemy situation, and time. [13] Log intelligence provides the commander a mosaic picture of the operational distribution environment in the three dimensions. This intelligence was critical to 3D logistics and the application of battle command. Examples of this process in Afghanistan were the interviews of local-national (LN) drivers. These interviews focused on enemy threats along the routes which the local-national drivers travel, and any corruption or theft by Afghan National Army (ANA) or Afghan National Police (ANP) forces. Intelligence officers in logistics units collected and analyzed these interviews and provided for better clarity to the visibility leg of the trinity. Visualizing the distribution environment and properly building capability with the integrated use of intelligence mitigated each future challenge.

Afghan Case Study

The Afghan experience of expeditionary distribution focused on a Three-Dimensional Logistics (3D Log) approach because of the shortage of available logistics forces at the operational level, the decentralized nature of the war, and the poor condition of the road networks. Operation Enduring Freedom provides a great opportunity for analysis of the relationship of operational distribution and its effect on joint forces' conduct of combat operations. The 4 / 82 IBCT (Task Force Fury) conducted full-spectrum operations from January 2007 to April 2008. BCT logistics

formations sustained fifteen, battalion-level, coalition commanders in the Paktika-Paktya-Khost-Ghazni-Logar (P2KGL) Region for sixteen months. The operating environment consisted of 27,000 square miles of mountain ranges as high as 14,000 feet in height, high-plain deserts, limited road networks, a determined enemy, and severe weather. [14]

In Afghanistan, 3D Logistics sustained full-spectrum combat operations for many isolated, forward-deployed troops. The immature infrastructure and harsh environment required innovative air and ground transportation operational solutions. In many cases, conventional truck-distribution assets were inadequate to re-supply forward-deployed forces. Expeditionary distribution capabilities working in three dimensions ensured delivery of critical supplies, fuel, food, ammunition, and repair parts. Methods of 3D Logistics were DoD helicopter (green air); contracted, rotary-wing air, e.g. Mi-8; fixed-wing air, e.g. CASA-212; Combat Logistics Patrol; commercial trucks, e.g. “jingle” truck; USAF aerial delivery; and donkey portage.[15] Proper application of each ensures sustainment through the strategic distribution pipeline to meet the maneuver commander’s requirements at the operational and tactical levels.

A description of the “operational geometry” of Afghanistan is best with a comparison to Iraq. LOCs in Iraq for the most part are passable by heavy, commercial-style vehicles and not impacted by weather and terrain to the same degree as Afghanistan. Iraqi MSRs/ASRs may shut down due to sandstorms for short periods lasting days, versus weeks in Afghanistan. In many locations in Afghanistan, historical data showed that roads, all roads in a Battalion Task Force AO for example, were typically shut down for surface distribution for twelve of thirty days during each winter

month.[16] In Iraq, echelons above brigade (EAB) level secured operational sustainment. In most cases area Corps Support Groups/Sustainment Brigades (CSG/SB) either escorted their own convoys, or theater-security forces escorted theater-level moves with gun-trucks, all the way to the BSBs.

In Afghanistan, from January 2007 to April 2008, no truck assets above IBCT level deployed in support of Regional Command East (RC-E). Each BSB secured all moves out of their battlespace by internal US combat power or commercial trucks nicked named “jingle” trucks, moving with no security or very limited command and control. Additionally, in Afghanistan there is very little engineer support for mobility missions, military or host nation, to fix LOCs when needed and no bridging assets to make ground LOCs less precarious. This lack of mobility-improvement capability contributed to a very-hazardous transportation environment for any vehicle larger than a HMMWV. In Afghanistan there are a large number of Combat Out Posts (COPs), Fire Bases (FBs), and U.S. bases with virtually no access by ground, for example, an FOB called Nawa located in the southern part of the RC-E battlespace. Logisticians organized and executed two or three convoy movements to Nawa in the sixteen months of the BCT’s deployment. Operational sustainment of that base over the long term was challenging.

In Iraq ground moves are almost always an option. Iraq does have locations that are difficult to access because of threat, but these are all linked to reasonable road networks. In critical moments during the early stages of OIF rotations, units executed HET movement across the desert when there were no real roads available to support

particular operations. In the high, Afghan, mountain terrain this mobility is just not possible.

Under-resourced distribution assets in Afghanistan are stretched during unit deployment and redeployment cycles. The shortage of operational and tactical distribution assets compete with redeployments/deploying unit cargo against the theater deployment requirements. During non-surge periods, distribution is strategically delivered to the closest theater, sustainment hub. In the more mature theater of Iraq the closest SB or Expeditionary Sustainment Command (ESC) moves deployment, redeployment, and sustainment stocks from origin to the BCT AOR with throughput by MNC-I assets. Afghanistan provides considerable operational challenges as the two sustainment hubs are quite distant from battalion-level, Task Force operational areas. The Sustainment Trinity provides operational capabilities with very few real operational logistics assets assigned to either the Sustainment Brigade or ESC.

Another striking difference between Afghanistan and Iraq is the general absence of multiple levels of logistics C2. In Iraq, numerous CSBs/CSSBs under several CSGs or SBs under COSCOM or now ESC conducted operational logistics. In Afghanistan, the BSB routinely dealt directly with the Joint Logistics Command (JLC) which was really an Area Support Group (ASG) at the time, not a transformed SB with a Support Operations with more than 130 logisticians. In Afghanistan the BSB dealt with the next level of materiel managers, the 1st Theater Sustainment Command (TSC) in Kuwait. OEF logisticians of the BSB thus looked in-depth and were the only redundant material management.

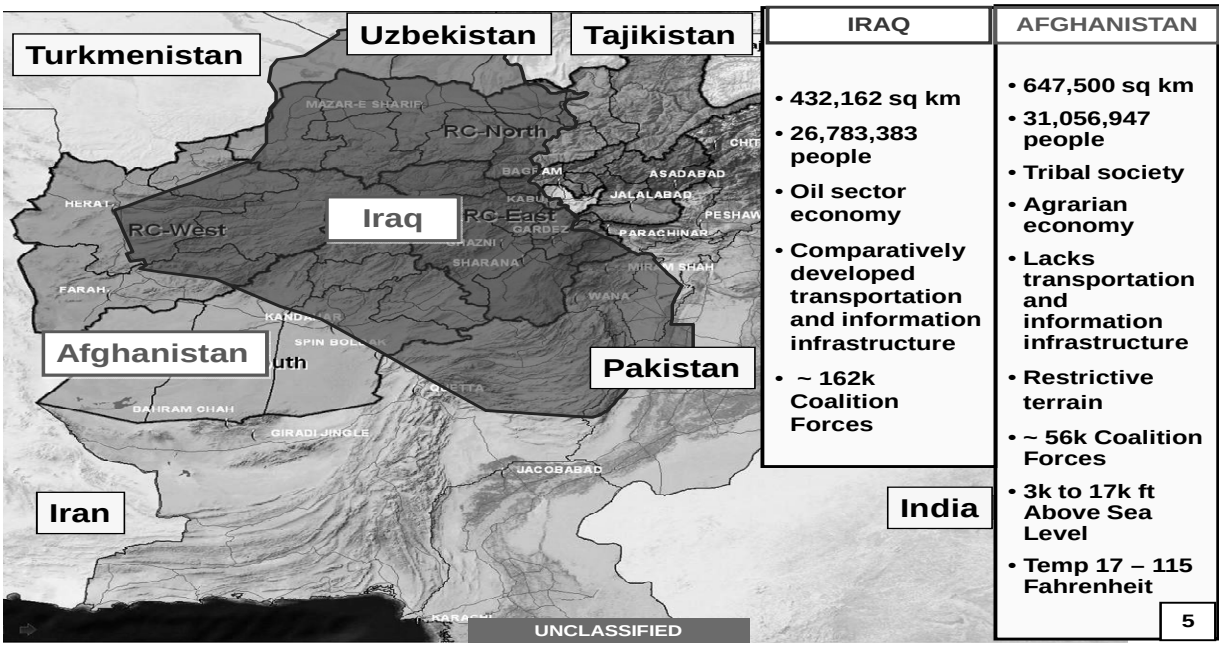

Figure 2.Graphical depiction of the expanse of Afghanistan in comparison to Iraq.

Sustainment leaders maintained the momentum of combat operations in the Afghan environment by attempting to look at the logistics space in the three dimensions. By looking at the geometry of Afghanistan in this manner, TF Fury delivered over 6.6 million pounds via Containerized Delivery System (CDS) and operationalized the Low Cost Low Altitude (LCLA) Parachute System, an experimental parachute system at the start of the rotation, which by the rotation's end had delivered 1.6 million pounds with point precision.[17] Additional resources included contracted rotary-wing aircraft, which distributed over 8 million pounds of supplies via four, contracted Russian helicopters, e.g. MI-8[18]; USAF aircraft; Army helicopters, and Combat Logistics Patrols (CLPs). Thus, 3D Logistics were the last leg of an operational-distribution construct to minimize the effects of the enemy, terrain, and weather.

The Afghan Model: A Case Study of COE Sustainment Operations

Three-Dimensional Logistics battle command visualized the space in terms of "Planning Time "vs." Reaction Time," enabling operational-logistics commanders to apply critical military assets to the fight. The below diagram describes the modes of 3D Logistics in Afghanistan between January 2007 and April 2008.

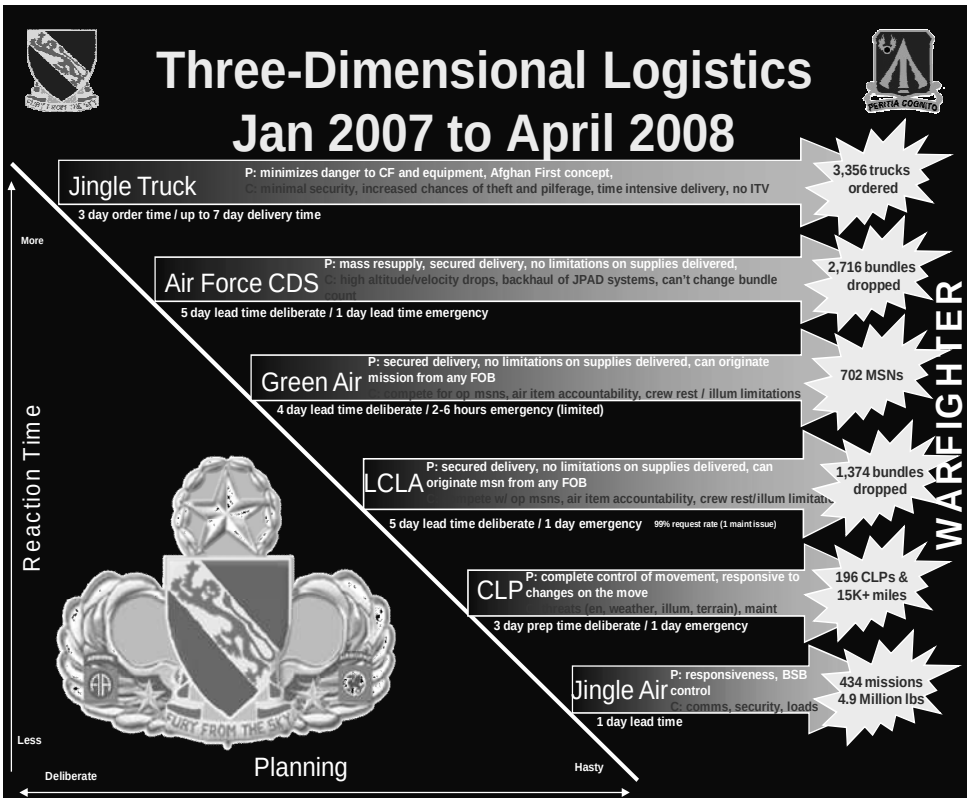

Figure 3. The methodology of Three-Dimensional Logistics.

Jingle Truck/Commercial Truck. Operational Advantages of commercial truck were minimal danger to Coalition Forces and equipment by having Afghan truckers move on the local/regional road networks. Additionally, U.S. reliance on commercial trucking organizations has improved Afghan regional and national trucking firms by performance-based contracts, furthering the Afghan-First concept of regional prosperity. Operational Disadvantage of the jingle/commercial-truck option is minimal security, and

increasing chances of theft and pilferage. This mode of distribution is best when customer wait time is not critical and the limited In-Transit Visibility (ITV) does not matter.

Joint logistics players managed distribution through Regional Command–East battlespace using over 3,356 commercial trucks in a twelve-month period. On average over two million gallons of fuel moved to the forty-two Forward Operating Bases (FOBs) within AO Fury monthly. Jingle truck was the ground component of three-dimensional logistics and was a composite that balanced commercial cargo and tankers, their crews, and in certain situations, escorts. Commercial, Afghan trucking was the slowest mode to distribute throughout the battlespace and had the highest risk for loss or pilferage. Balancing operational risk between coalition sustainment stocks and available U.S. security forces necessitated the majority of commercial-truck movements to proceed without U.S. escorts. Special cargo and ammunition required U.S. military escort or moved with scheduled, U.S. Combat Logistics Patrols.

Figure 4. Contract Afghan trucks called “Jingle Trucks.”

The Joint Logistics Command (JLC) also reduced risk through punitive actions to owners for loads not delivered to end destination or loads that were “light” because of pilferage reroute. Afghan-driver picture and personal information was inputted in the bio-metrics data base for verification that the driver that starts the move is the one who completed the mission. Additionally this bio-metric was helpful to use as evidence to impound the driver/truck and legal prosecution if the loads were short, thus reinforcing compliance. Most importantly, the JLC “blacklisted” or refused to do business with not only specific drivers but also trucks. In Afghanistan, the truck is worth more than the driver and thus blacklisting a specific truck encouraged Afghan cargo-delivery companies to eliminate pilferage. Additionally, the JLC had key, commercial trucks modified with special security containers and instrumented with In-Transit Visibility (ITV) to move unescorted cargo. These special containers provided a capability to transport new Up Armored HMMWVs (UAH) forward and retrograde battle-damaged equipment to secure locations without escort. BSB truck assets focused on the movement of exceptionally-critical items forward. As NATO increases force levels in Afghanistan, the commercial trucking industry will continue to grow, building added capability and capacity to legitimate, Afghan commerce.

Jingle-truck drivers were also the primary human sensors and intelligence-gathering platforms within the operational battlespace under 3D Logistics. The three hundred trucks contributed to the mosaic, logistical, intelligence picture.

Figure 5. Aerial delivery from a USAF C-17 into an Afghan drop zone.

USAF Aerial Delivery. USAF Aerial delivery provided operational advantage by enabling mass resupply to remote locations, secure delivery, and few limitations on type and quantity of supplies delivered. The operational disadvantage was the high, drop altitudes for Afghan drop zones, the associated velocity of drops, and the timely lift required to backhaul JPAD/G-12 systems. USAF delivery was not as flexible for tactical needs. Air-load planners were also resistant to change bundle count and sequence. As containerized delivery system (CDS) is a combat operation, the restrictiveness of the timeline/process may conflict with other maneuver operations.

Aerial delivery dropped over 2,716 bundles with approximately 6.6 million pounds. This aggressive approach required the most innovation and proved very effective to maintain offensive momentum during periods of limited accessibility of ground lines of communications (GLOCs). CDS was the most-commonly used method for the aerial insertion of supplies quickly for military and humanitarian assistance (HA) contingency operations. USAF C-130 and C-17 aircraft routinely dropped not only 105/155mm ammunition, but also mortars, small arms ammo, water, Class I UGR-A Dry

and Frozen, Class IV, and in contingencies, CL IIIB in 55-gallon drums and medical supplies.

USAF cargo aircraft demonstrated the true nature of joint interdependency. However, CDS missions had limitations with a seven-day request cycle, only to approved USAF-surveyed drop zones, and increased drop altitude/daylight-only drops as a method of risk mitigation. Emergency resupply with this mode was problematic and impractical.

Joint Precision Aerial Delivery Systems (JPADS) have mitigated some risk. These systems included a mission-planning hardware package in Air Force aircraft, parachute systems, and cargo-guidance systems. Risk mitigation with JPADS required cargo drop from altitudes above 5000 feet Above Ground Level (AGL), using Global Positioning Guidance Systems to achieve precise, extended glide to the point of impact.

The straight-and-level flight needed for precise airdrop is safest when the aircraft is above threat for Small Arms Fire (SAFIRE) and Man Portable Air Defense Missile Systems (MANPADS); however, the higher the drop altitude, the greater the lateral dispersion and time needed to locate and recover loads. A large drop zone also meant more ground troops. Dropping from higher altitudes in Afghanistan often required high-velocity airdrop techniques because of the high elevation of drop zones, many over 8000 feet, often resulting in decreased load survivability.

JPADs systems as currently fielded are immature, and operational results to date have shown marginal reliability. Moreover; the paucity of systems in theater made component retrograde a time-sensitive requirement. From the tactical perspective, units stopped requesting precision aerial delivery as results achieved had been no better than

unguided loads dropped from lower altitudes. The limitation translated to less operational flexibility for logistics support.

Figure 6. US Army helicopter delivery.

Military Helicopter delivery had the operational advantage that it provided a secure delivery with few limitations on types of supplies or weight delivered to high mountain LZ/PZ, and origin of mission from any FOB. Proper CONOP planning, pickup, and landing zones with US military helicopters can effectively support operations in progress. Additionally, CH-47s' lift capability exceeded that of the typical contracted, rotary-wing aircraft. Operational disadvantages were a shortage of helicopter companies, with fewer helicopters in those companies, thus pitting logistics in competition with operational missions for lift support. Additionally, available blade hours, air-item accountability for external slings/blivets, crew management, illumination days at high altitude, lift-capability limitations, and non-standard HLZ considerations were further constraints to the execution of logistics by military helicopters.

Military helicopter was the primary means to move personnel, mail, and special cargo. Nonetheless, in the twelve-month period there were only 720 logistics missions accomplished out of 2500 movement requests. This inconsistent support was due to the shortage of air frames, pilots, hazardous weather, and combat missions with higher

priority, thus affecting resupply “ring routes” and the standard delivery of mail and personnel returning from leave. However, this capability was critical to move logistics personnel and contractors around the battlefield.

Figure 7. Low Cost Low Altitude (LCLA) parachute delivered by commercial CASA 212.

Contracted, Fixed-Wing Support. Operational advantages of contract fixed-wing were secure delivery, few limitations on supplies delivered, and mission origin from any FOB with an unimproved short, airfield. Contract air provided critical capability to use the Low Cost Low Altitude (LCLA) drop missions.[19] Resupply of units on the move by LCLA drops allowed units at very small COPs to utilize improvised/small drop zones in or near base, and an increased level of security on the drop zone. Operational disadvantage of contract fixed-wing was that logistics units again competed with operational/VIP missions; there were also no night operations for civilian air crews.

Contracted, fixed-wing support in Afghanistan was the primary means of mission success for operational logistics commanders. Commercial aviation gave the JLC an affordable, flexible, air asset with routine and timely travel to forward operating bases. This commercial service expanded a flexibility to deliver personnel, materiel, and other supplies, thus ensuring proper end-to-end distribution, without waiting to fill larger,

USAF cargo aircraft. This contract capability was a bridging solution to push combat power forward from operational APODs to tactical/operational logistics units.

Commercial aviation's routine contribution was general and varied. Small groups had access to air transport to forward operating bases (FOBs) who would otherwise have been unable to travel using military air assets. Personnel on emergency leave scattered around the BCT's AO moved to larger bases, expediting return travel to CONUS. Coordination for these missions was electronic with a near-immediate response. The real-time visibility provided advantages to all leaders within the battlespace that were incalculable. Commercial air likewise moved volumes of mail and money. Delivering these critical items daily to remote locations increased morale and ensured that Commander's Emergency Response Program (CERP) funds were available.

Senior military officers and civilians, entertainers, and other officials were also able to fly to locations throughout Afghanistan and Pakistan to conduct essential mission coordination and site visits. This service afforded both units on the ground and visiting officials increased operational flexibility.

Low Cost Low Altitude (LCLA) airdrops delivered over 1800 bundles with 1.4 million pounds. The LCLA program was a new and innovative means of aerial delivery which worked throughout the Paktika-Paktya-Khost-Ghazni-Logar (P2KGL) Region within Southeastern Afghanistan. LCLA system was/is designed to provide a "one-time" solution that is reliable and inexpensive, less than three hundred dollars a bundle. LCLA was ideal for units with no organic rigger support and/or not typically trained in aerial resupply operations. This program differs from the USAF High Velocity CDS

drops in that bundles are smaller; delivered at a very low altitude from a smaller, civilian-style aircraft; and landed almost with pinpoint accuracy, usually within 50 meters of the established point of impact (PI).[20]

The Short Takeoff and Landing (STOL) capabilities likewise provided invaluable flexibility to the maneuver commanders. This critical capability enabled logistics commanders to support counter insurgency, humanitarian, and combat operations simultaneously. Afghan political and military leaders visited their people on the ground at home. In a country where governance had stopped at the end of a road, this aspect of logistics support to COIN greatly expanded Afghan governmental influence.

Figure 8. Combat Logistics Patrols (CLP) on poor roads.

*Combat Logistics Patrol (CLP). CLP's o*perational advantage was the ability to have complete control of movement, responsiveness to changes on the move, oversized-loads capability, night moves, and flexibility to move cargo both ways. The principal operational disadvantage of CLP movements was the exposure of US personnel to the threats; CLPs were uniformly hard on manpower and equipment.

The JLC had no external, echelon-above-brigade (EAB) ground-distribution assets to help the two brigades. This critical logistics shortfall forced both maneuver

brigades working along the Afghan-Pakistani border to execute distribution from their brigade's sector back to Bagram Air Field (BAF). TF Fury's Distribution Company, A Co, 782nd BSB, conducted 196 missions, in and out of sector, over 15,000 miles on the harsh Afghan roads, essentially serving as EAB truck companies. TF Fury had only organic assets composed of limited Stay-Behind Equipment (SBE), and few distribution platforms deployed from Fort Bragg, to execute these missions. A Co had 12 LHS/PLS/Flatbed equivalents compared to over 261 each for the same-sized operational area in Iraq. TF Fury grew this capability internally from zero in Afghanistan, and then moved CLPs throughout the supported maneuver commanders' operational areas. Additionally, internally-resourced security operations enabled linkage of the key convoy components of "escort/tanker/crew requirement." A Blanket Purchase Agreement (BPA) for jingle-truck fuel tankers further enabled operational distribution, linking contracted, local truckers to support BCT's daily missions.

Figure 9. Contract, rotary wing conducting distribution missions.

Contract Rotary Wing (Jingle Air). Operational advantages were the daily responsiveness; logistics units' control of CONOP development; loading of aircraft; and tasking of the configuration of aircraft delivery method, e.g. internal, external, A22 bag, bilvet, cargo net, etc. Operational disadvantages were non-secure communication with

aircraft, no security for aircraft during flight, load limits, contract administration for pilots, and interpreters for Russian pilots.

Jingle air moved 8.8 million pounds for the BCT Commander in TF Fury's AO alone. Three, contracted Mi-8 "HIPs" and crews worked directly for the BSB. Each Mi-8 had a 4000-pound internal capacity plus an external-load capability at all altitudes of established bases. Mi-8s carried all commodities with the following limitations: no personnel, ammo under 81 mm mortar, mail, and sensitive items. The BSB staff drafted and briefed daily missions to Russian crews. Another operational benefit that the BSB staff used extensively was the Mi-8's capability to retrograde all types of items back to major logistics hubs.

Recommendations:

Future logistics capabilities must enhance full-spectrum operations around the globe by providing operational logistics commanders multi-dimensional distribution capability to implement the Sustainment Trinity. The Sustainment Trinity is the framework that provides operational logistics commanders the ability to visualize the environment and influence it early. Joint logistics formations must be capable to execute high-tempo sustainment to maintain the momentum of combat operations.

This case study suggests the need to change or adjust doctrine and training, expand current assets, invest in future capabilities, and responsive, short-notice, contingency contracts that support this Sustainment Trinity more effectively. The joint force must have organic 3D-Logistics capabilities available to deploy early to ensure operational sustainment until contingency contracts can activate to support the duration of operations as well.

Joint logistics doctrine currently does not excel at genuine, expeditionary distribution throughout the end-to-end distribution pipeline. This strategic, joint vision of distribution must articulate that sustainment continually happens in the "three dimensions" at all levels. Sustainment formations must look at distribution with a 3D view in order to apply distribution assets by time/space/mission, assets available, and merit correctly.

Joint and Army doctrine do not address the context of applying distribution capabilities within the three-dimensional context at the operational level. Joint doctrine in JP 4-09, *Global Distribution,* demonstrates the disconnected focus. Currently, joint distribution outlines four, separate networks: physical, financial, informational, and communicational; these demonstrate the weakness of stovepiped links during every operation. The joint distribution system does not conceptualize in terms of three-dimensional distribution from strategic to tactical.[21]

Training for 3D logistics must introduce all sustainment officers to the holistic considerations of ground, commercial and military helicopter, USAF combat offload and CDS, LCLA parachute operations out of the Joint Cargo Aircraft, commercial contractors, and any other distribution capability available. This three-dimensional staff and leader training needs to focus on the visualization and inter-connectiveness of the joint distribution enterprise. This focused, leader development should encompass all possible themes of three-dimensional thinking, including ship-to-shore or truck-to-donkey delivery into mountainous areas. Future logistics leaders at all levels must be able to maintain full-spectrum operations using distribution capacity that today will seem "unconventional." Growing a leader's ability to understand the Distribution Trinity and

leverage 3D capabilities will be the measure of future success. Doctrine and training of the future must clearly map visualization of available distribution assets at strategic, operational, and tactical levels.

Distribution today remains a ground-transportation-centric approach that considers air the exception at tactical and operational levels. In the short term the joint force needs to expand capacity to resource logistics distribution in the three dimensions. For example, operational experience has demonstrated that the shortage of helicopters is a recurring issue. The reorganization of Army, heavy-lift helicopter companies during transformation increased the number of companies but shrunk the number of helicopters in each company from sixteen to twelve. The realities of readiness rates adversely affect each company's ability to support sustainment missions. The need for these helicopter assets can no longer be an afterthought within the 3D logistics construct. The logistics war fighting function needs to communicate the operational risk by shrinking these heavy-lift helicopter companies. One of the direct outcomes of these shortages has been increased use of contract-helicopter support because joint aviation assets cannot meet the requirements.

Joint sustainment in the three dimensions will still conduct distribution using ground-transportation assets. The U.S. Army as executive agent for Common User Land Transport (CULT) needs to develop a more multi-mission truck fleet. The composition of the distribution companies needs to be a mix of tractor trailer and Palletized Load System (PLS) in a balanced approach. One great success in the Afghan case study was the superior performance of the M1088 in line-haul operations. It provided considerable load flexibility, was more maneuverable than the PLS, and

carried a crew-served weapon. In short, sustainment formations must execute full-spectrum operations with traditional transportation assets in an interconnected, three-dimensional approach at the operational level.

In addition, other seams in the distribution chain are in number and location of enablers like Material Handling Equipment (MHE), container transfer capability in Container Handling Units (CHU), and organic lowboy or HET support for movement and/or recovery of oversized equipment like Stryker and Mine Resistant Ambush Protected Vehicles (MRAPs). Further discussion is beyond the scope of this paper.

The future of three-dimensional logistics will also require an investment in joint capabilities. The C27 Spartan Joint Cargo Aircraft (JCA) is a critical enabler for expeditionary distribution. *A* study by Rand Corp., stated that the U.S. Army has a requirement for such an operational, distribution capability.[22] The JCA will provide an operational-level lift capability to bridge the gap between strategic and tactical, rotary-wing lift to distribute on far-flung battlefields. Additionally, JCA will reduce dependence upon contracted fixed-wing as seen now in Iraq and Afghanistan.

If joint inventories cannot support distribution, then the Army should establish V-22 Osprey formations, which would be critical to operational sustainment during expeditionary operations, especially protracted COIN. The V-22 is the only vertical platform capable of rapid self-deployment to any theater of operation worldwide.

The Afghan experience has demonstrated that a key innovation to expand capacity within three-dimensional distribution capabilities is contract air. Contract-helicopter support of joint operations was a great success in Afghanistan.

USTRANSCOM needs to ensure the contingency contractors have the ability to execute standing contracts around the world. Planners at USTRANSCOM must visualize the logistics battlefield in 3D to ensure the execution of end-to-end distribution by contract solution if necessary. These USTRANSCOM contracts must address contingency rotary- and fixed-wing aircraft, as well as the conventional, commercial, distribution assets contracted locally by the supporting contracting office.

Sustainment in Afghanistan in 2007 to 2008 is a case study in operational, expeditionary distribution. Truly joint, interdependent distribution will use a Three-Dimensional Logistics (3D Logistics) approach, executing air, land, and sea modes from strategic to tactical levels. DoD's ability to leverage these expeditionary distribution capabilities will ensure the momentum of full-spectrum operations around the globe for years to come.

Endnotes

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